

In re: Matthew Donofrio
Application No.: 10/815,293
Filed: April 1, 2004
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In the claims:

1. (Currently Amended) A method of forming light extraction features for a light emitting device having a substrate and a semiconductor light emitting element on the substrate, comprising:

shaping a surface of a semiconductor layer of the light emitting device utilizing a laser to define three dimensional geometric patterns in the layer, wherein shaping a surface of a semiconductor layer utilizing a laser to define three dimensional geometric patterns in the semiconductor layer comprises:

patterning a mask layer on the semiconductor layer using a laser to remove mask material, wherein patterning the mask layer comprises applying laser light to the mask layer at an energy sufficient to remove material from the mask layer; and etching the semiconductor layer using the patterned mask layer to define the three dimensional geometric patterns.

2. (Withdrawn) The method of Claim 1, wherein the semiconductor layer comprises a layer of the light emitting element.

3. (Withdrawn) The method of Claim 1, wherein the semiconductor layer comprises a contact layer of the light emitting element.

4. (Previously Amended) The method of Claim 1, wherein the semiconductor layer comprises the substrate of the light emitting device.

5. (Original) The method of Claim 4, wherein the substrate comprises a silicon carbide substrate.

6. (Original) The method of Claim 4, wherein the substrate comprises a sapphire substrate.

7. (Cancelled)

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8. (Withdrawn) The method of Claim 2, wherein applying laser light to the semiconductor layer is followed by etching the semiconductor layer.

9. (Withdrawn) The method of Claim 8, wherein etching the semiconductor layer comprises anisotropically etching the semiconductor layer.

10-11. (Cancelled)

12. (Original) The method of Claim 1, wherein a plurality of geometric patterns are provided in the surface of the semiconductor layer, the geometric patterns extending into the semiconductor layer and having uninterrupted perimeters at a same level of the semiconductor layer.

13. (Original) The method of Claim 4, wherein the surface of the substrate is on a side of the substrate opposite the light emitting element.

14. (Withdrawn) The method of Claim 4, wherein the surface of the substrate is on a same side of the substrate as the light emitting element.

15. (Cancelled).

16. (Withdrawn) The method of Claim 1, wherein the three dimensional geometric patterns include parabolic features.

17. (Original) The method of Claim 1, wherein a plurality of geometric patterns are generated in the surface of the semiconductor layer, the plurality of geometric patterns including a plurality of different geometric patterns.

18. (Withdrawn) The method of Claim 1, wherein the geometric patterns provide a curved substrate.

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19. (Withdrawn) The method of Claim 1, wherein the geometric patterns comprise lenses formed in the semiconductor layer.

20. (Withdrawn) The method of Claim 1, wherein the geometric patterns comprise a plurality of sinusoidal grooves in the semiconductor layer.

21. (Original) The method of Claim 1, wherein the geometric patterns comprise randomization features formed in the semiconductor layer.

22. (Cancelled)

23. (Previously Presented) The method of Claim 1, wherein the mask is a polymer mask.

24. (Cancelled)

25. (Previously Presented) The method of Claim 1, wherein patterning a mask layer on the semiconductor layer using a laser comprises:
patterning a master template with a laser; and
embossing the mask layer using the master template.

26. (Original) The method of Claim 4, further comprising forming the light emitting element on the substrate.

27. (Original) The method of Claim 26, wherein forming the light emitting element is carried out subsequent to shaping the surface of the substrate.

28-45. (Cancelled)

46. (Currently Amended) A method of shaping a surface of a silicon carbide substrate, comprising:

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patterning a mask layer on the silicon carbide substrate using a laser to remove material from the mask layer, wherein patterning the mask layer comprises applying laser light to the mask layer at an energy sufficient to remove material from the mask layer; and

etching the silicon carbide substrate using the patterned mask layer to define the three dimensional geometric patterns.

47. (Original) The method of Claim 46, wherein the mask is a polymer mask.

48. (Original) The method of Claim 46, further comprising forming a light emitting element on the substrate.

49. (Original) The method of Claim 46, wherein a shape of the pattern of the mask layer is based on a difference between an etch rate of the silicon carbide substrate and an etch rate of the mask layer.

50. (Original) The method of Claim 46, further comprising forming a micro-mask between the mask layer and the silicon carbide substrate, the micro-mask being configured to roughen a surface of the substrate during etching.

51. (Original) The method of Claim 50, wherein the micro-mask comprises an aluminum layer between the mask layer and the substrate.

52. (Previously Presented) The method of Claim 46, wherein the three dimensional geometric patterns comprise a plurality of different geometric patterns.

53. (Previously Presented) The method of Claim 52, wherein the plurality of different geometric patterns are provided in a single etch and in a single patterning of the mask layer.

54-75. (Cancelled).